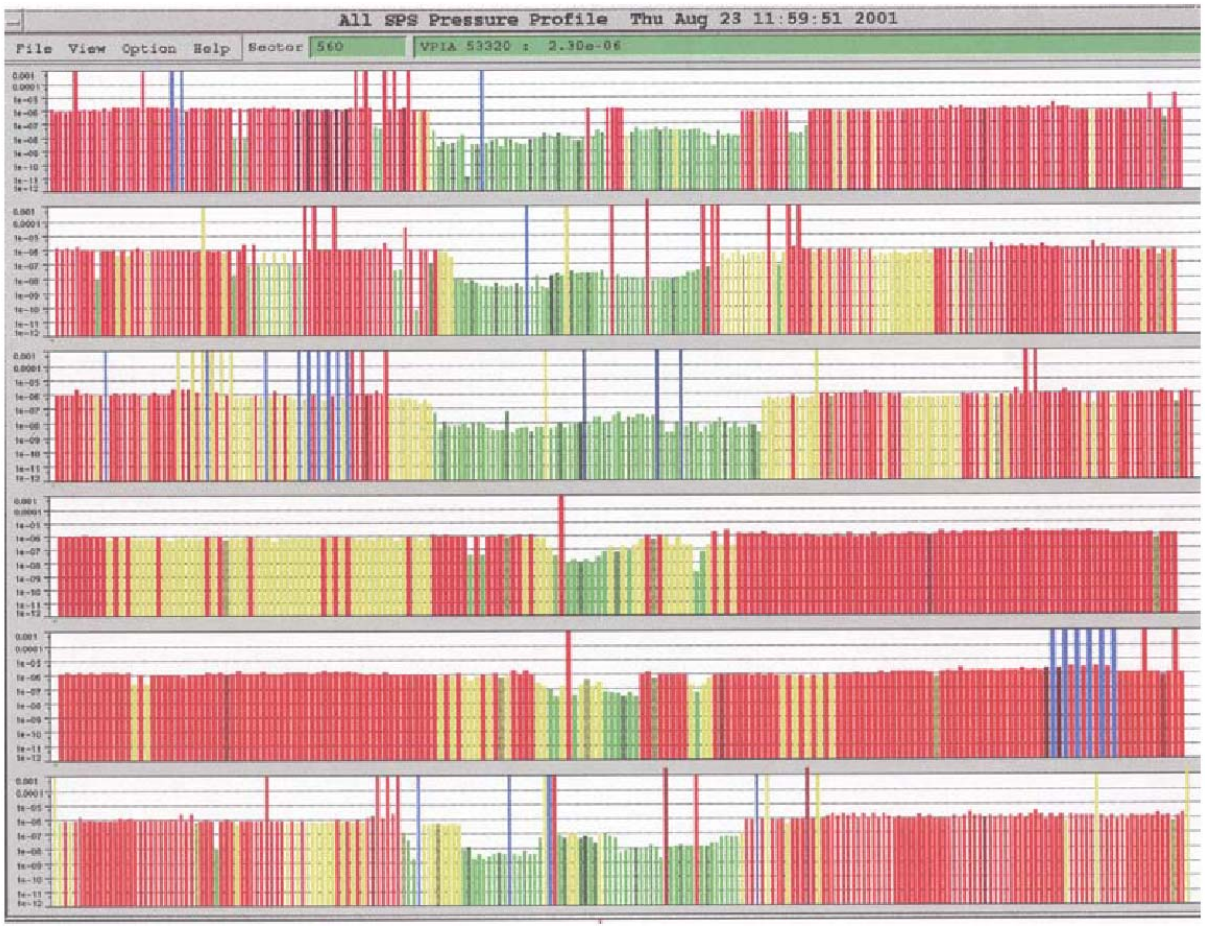
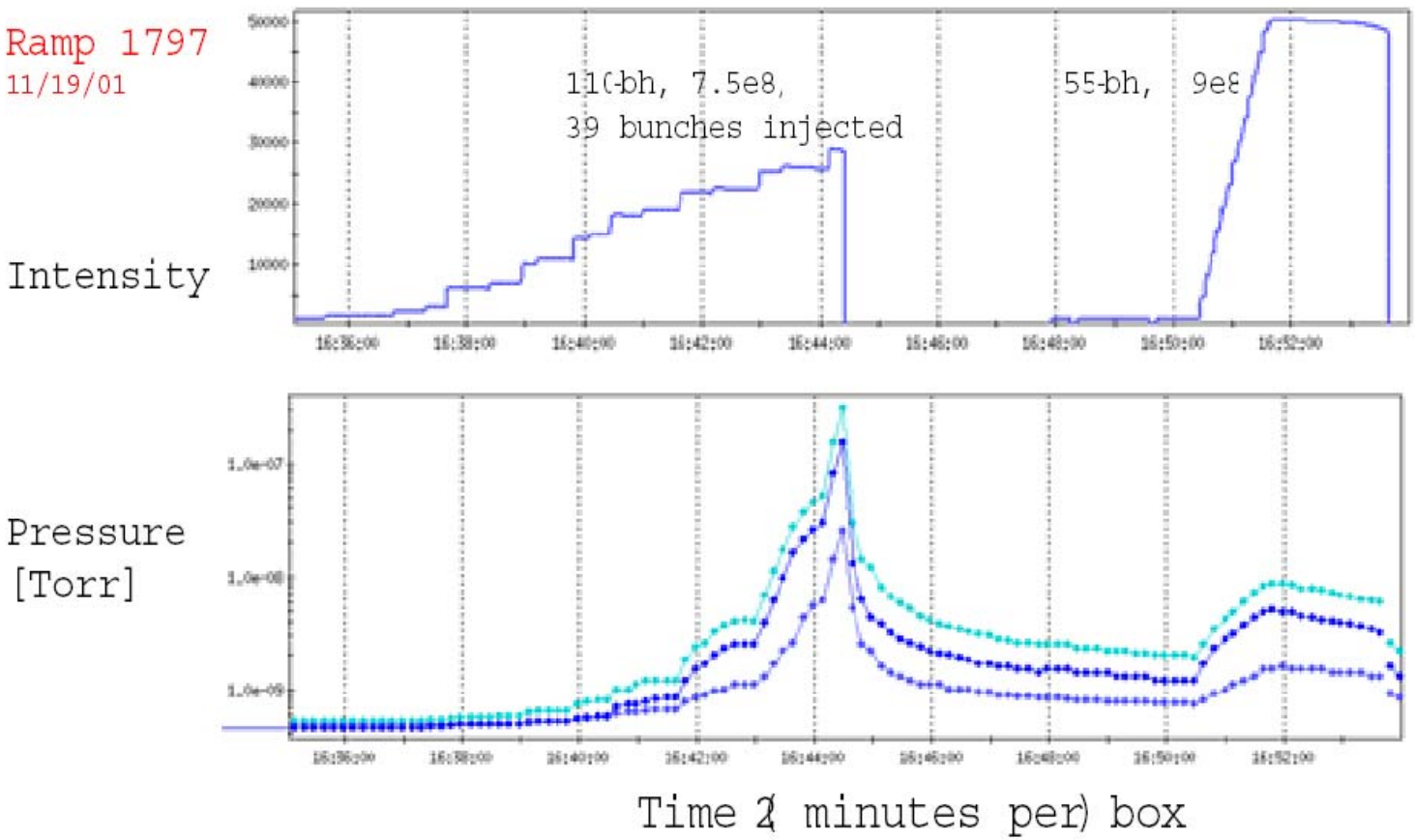
Recommendations and Action Items: MI Upgrade / Transport Line

- Electron cloud effect
  - None of the present Fermilab machines has this problem
  - However, a parameter comparison of an upgraded MI with other machines brings up the concern:
    - MI: proton, 3e11, 53 MHz, 19 ns spacing
    - SPS: proton, 1e11, 200 MHz, 25 ns spacing
    - RHIC: Au+79, 1e9, 28 MHz, 108 ns spacing
  - Experts: M. Furman, F. Zimmermann, K. Ohmi
  - Visit by Miguel in April for a crash course
  - Form an in-house team: Ostiguy, Zhang (simulation), Ng (instabilities)

Electron Cloud Problem: SPS Vacuum



Electron Cloud Problem: RHIC Vacuum



Recommendations and Action Items: MI Upgrade / Transport Line (cont…)

- MI capture scheme, adiabatic vs. rf capture (Ostiguy)
- Fast chopping
  - Laser (Tomlin)
  - LANL chopper for SNS (S. Kurrenoy)
- Survey of aperture
  - Dynamics aperture of the ring: 127±4 pi
  - Physical aperture at Lambertson area (Chou, Johnson)
    - Present: 40 pi
    - With large aperture quad: 80 pi
  - Physical aperture at MI-10 in the proton driver era
    - Presenr dsign: 60 pi
    - New design: > 100 pi (Drozhdin)
  - Physical aperture at Kickers (TBA)

Recommendations and Action Items: MI Upgrade / Transport Line (cont…)

- Survey of impedance
  - Tune shift measurement (Marchionni)
  - Cavity measurement (Wildman)
  - Need a program for more measurements (MID)
- Optimize MI-10 injection scheme
  - Foil (Lackey, Moehs, Tomlin)
  - Painting (Drozhdin)
  - Clearance (Drozhdin)
  - Operational considerations
  - Many other issues
- Injection/transition crossing requirements, which give guidance to the requirement of linac rf control (Ostiguy)
- Tracking from injection through transition crossing (Lucas, Yoon)

Recommendations and Action Items: MI Upgrade / Transport Line (cont…)

- LCW activation (Kostin)
- MI-40 dump capability (Kostin)
- Instabilities (Ostiguy, Ng, Chou)
- 3D space charge simulation (Yoon)
- MI beam studies (MID)
- Large aperture quad (TD/AD, first magnet May 23)
- Transition crossing and gamma-t jump implementation (Ostiguy, Chou)
- Collimators (Drozhdin, Brown)
- RF
  - Two-PA upgrade (Reid)
  - New rf system (Wildman, Chen, Wu, Qian)

Recommendations and Action Items: MI Upgrade / Transport Line (cont…)

- Effect of orbit errors (e.g., power supply ripples) on collimators (Drozhdin)
- Performance under off-normal condition (e.g., very large transverse emittance growth in the linac) on collimation, foil scattering and painting (team work)
- Mitigation plan of blackbody stripping
  - H^0 intercept (Kostin)
  - Cold beam screen (Harding)
  - Other ideas
- Diagnostics requirement, e.g., fast beam loss monitors (TBA)

Recommendations and Action Items: General

- 3 ms vs. 1 ms (team work)
  - Lorentz detuning
  - Microphonics
  - SRF performance
  - Foil scattering and heating
  - Injection loss
  - Activation in the injection area
- One-day mini-review of transport line and MI injection (TBA)

We need a prioritized plan for executing this list